Exercise - I (Conceptual Questions) Build Up Your Understanding

TERMINOLOGY OF COORDINATION COMPOUND

1. In the complex ion $[Fe(EDTA)]^-$ the coordination number and oxidation state of central metal ion is :-
(1) C.N. = 6 O.N. = +3
(2) C.N. =1 O.N. = −1
(3) C.N. = 4 O.N. = +2
(4) C.N. = 3 O.N. = +3

2. The coordination number and oxidation number of the central metal ion in the complex $[Pt(en)_2]^{+2}$ is :-
(1) C.N. = 2, O.N. = +2 (2) C.N. = 6, O.N. = +4
(3) C.N. = 4, O.N. = +4 (4) C.N. = 4, O.N. = +2

3. Select bidentate or didentate ligand from the following.
(1) CO (2) SCN^-
(3) CH_3COO^- (4) $C_2O_4^{2-}$

4. The oxidation and coordination number of Pt in $[Pt(C_2H_4)Cl_3]^-$ is respectively :-
(1) + 1, 3 (2) + 2, 4 (3) + 3, 6 (4) + 2, 5

5. The CN and ON of X in the complex compound $[X(SO_4)(NH_3)_5]$ will be respectively :-
(1) 10 and +3 (2) 1 and +6
(3) 6 and +4 (4) 6 and +2

6. What is the oxidation number of Fe in $[Fe(H_2O)_5(NO)]^{2+}$ ion?
(1) +2 (2) +3 (3) +1 (4) 0

7. Which one is a heteroleptic complex ?
(1) Ferrocene (2) Chromocene
(3) Prussian blue (4) Zeise's salt

8. Select the set representing correct statements only.
(I) A coordination entity constitutes a central metal atom or ion bonded to a fixed number of ions or molecules.
(II) Ligand having two different or similar donor atoms in the complex is called bidentate ligand.
(III) All bidentate ligands are chelating ligands.
(IV) Ni^{+2}, Co^{+3} and Fe^{+3} are acting as Lewis acids in $[NiCl_2(H_2O)_4]$, $[CoCl(NH_3)_5]^{+2}$ and $[Fe(CN)_6]^{-3}$.
(1) I, II, III and IV (2) II and III
(3) I, III and IV (4) I, II and IV

9. Oxidation number of Cobalt in $K[Co(CO)_4]$ is :-
(1) +1 (2) −1 (3) 0 (4) +2

10. Which of the following species is not expected to be ligand :-
(1) NO (2) NH_4^+
(3) $NH_2CH_2CH_2NH_2$ (4) CO

11. Identify the statement which is not correct :-
(1) Coordination compounds are mainly known for transition metals.
(2) Coordination number and oxidation state of central metal atom in a complex is same.
(3) Ligand donates at least one electron pair to CMA
(4) $[Co(NH_3)_4Cl_2]^+$ is a heteroleptic complex.

12. Which of the following ligands will not show chelation?
(1) EDTA (2) DMG
(3) Ethane-1, 2 diamine (4) SCN^-

IUPAC - NOMENCLATURE

13. $K_3[Fe(CN)_6]$ is :-
(a) Potassium hexacyano ferrate (II)
(b) Potassium hexacyano ferrate (III)
(c) Potassium ferri-cyanide
(d) Hexacyano ferrate (III) potassium
Correct answer is :-
(1) Only (a) and (b) (2) Only (b) and (c)
(3) Only (a) and (c) (4) Only (b) and (d)

14. Give the IUPAC name of the complex compound $[Co(NH_3)_4(H_2O)Br](NO_3)_2$.
(1) Bromoaquotetraamine Cobalt (III) nitrate
(2) Bromoaquotetraaminocobalt (III) nitrate
(3) Bromoaquatetraammine cobaltate (III) nitrate
(4) Tetraammineaquabromido cobalt (III) nitrate

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15. Which of the following complex is anion :-
(1) Fluoro pentaammine cobalt(III)
(2) Trioxalato ferrate(III)
(3) Penta Carbonyl iron(0)
(4) Dichloro diammine platinum(II)

16. The chloro-bis (ethylenediamine) nitro cobalt (III) ion is :-
(1) $[Co\ (NO_2)_2\ (en)_2\ Cl_2]$
(2) $[CoCl\ (NO_2)_2\ (en)_2]^+$
(3) $[CoCl\ (en)_2\ NO_2]^+$
(4) $[Co\ (en)\ Cl_2\ (NO_2)_2]^-$

17. Which of the following complexes is not a chelate
(1) bis (dimethylglyoximato) nickel(II)
(2) Potassium ethylenediaminetetra thiocyanatochromate(III)
(3) Tetrammine dichlorocobalt(III) nitrate
(4) Trans–diglycinatoplatinum(II)

18. The correct IUPAC name of the complex $[Fe(\eta^5\text{–}C_5H_5)_2]$ is
(1) Cyclopentadienyl iron (II)
(2) Bis (cyclopentadienyl) iron (II)
(3) Dicyclopentadienyl ferrate (II)
(4) Ferrocene

19. The correct name of $[Pt(NH_3)_4Cl_2]\ [PtCl_4]$ is :-
(1) Tetraammine dichloro platinum (IV) tetrachloro platinate (II)
(2) Dichloro tetra ammine platinum (IV) tetrachloro platinate (II)
(3) Tetrachloro platinum (II) tetraammine platinate(IV)
(4) Tetrachloro platinum (II) dichloro tetraamine platinate (IV)

20. The IUPAC name of $K_2[Cr(CN)_2O_2(O)_2(NH_3)]$ is:-
(1) Potassiumamminedicyano dioxoperoxochromate(VI)
(2) Potassium-ammine-cyano-peroxodioxo chromium (VI)
(3) Potassiumamminecyanoperoxodioxo chromium (VI)
(4) Potassiumamminecyanoperoxodioxo chromate (IV)

21. The IUPAC name for $[Co(NH_3)_6]\ [Cr(CN)_6]$ is :-
(1) Hexaammine cobalt (III) hexacyanochromate (III)
(2) Hexacyanochromium cobalt hexaammine (VI)
(3) Hexaammine cobalt (III) hexacyanochromium (VI)
(4) Hexacyanochromium (III) hexaammine cobalt (III)

22. The IUPAC name for $[Co(NCS)\ (NH_3)_5]Cl_2$ is :-
(1) Pentaammine (thiocyanato-N) cobalt (III) chloride
(2) Pentaammine (thiocyanato-S) cobalt (III) chloride
(3) Pentaammine (isothiocyanato-N,S)cobalt (III) chloride
(4) Pentaammine (mercapto-N) cobalt (III) chloride

23. Which rule is incorrect regarding IUPAC nomenclature of complex ions ?
(1) Cation is named first and than anion is named
(2) In the coordination sphere, the ligands are named alphabetically.
(3) Positively charged ligands have suffix-ate.
(4) More than one same type of ligands are indicated by di, tri, tetra etc.

WERNER'S THEORY & EAN

24. Which of the following has least conductivity in aqueous solution.
(1) $CoCl_3{\cdot}4NH_3$ (2) $CoCl_3{\cdot}3NH_3$
(3) $CoCl_3{\cdot}5NH_3$ (4) $CoCl_3{\cdot}6NH_3$

25. If EAN of a central metal ion X^{+2} in a complex is 34. and atomic number of X is 28. The number of monodentate ligands present in complex are:-
(1) 3 (2) 4 (3) 6 (4) 2

26. The EAN of cobalt in the complex ion $[Co(en)_2Cl_2]^+$ is :-
(1) 27 (2) 36 (3) 33 (4) 35

27. The effective atomic number of Cr (atomic no. 24) in $[Cr(NH_3)_6]\ Cl_3$ is
(1) 35 (2) 27 (3) 33 (4) 36

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28. Which gives only 25% mole of AgCl, when reacts with $AgNO_3$:-
(1) $PtCl_2.4NH_3$ (2) $PtCl_4.5NH_3$
(3) $PtCl_4.4NH_3$ (4) $PtCl_4.3NH_3$

29. In the metal carbonyls of general formula $M(CO)_x$ (Which follows EAN rule) if M is Ni, Fe and Cr the value of x will be respectively:-
(1) 6, 5, 6 (2) 4, 5, 6
(3) 4, 4, 5 (4) 4, 6, 6

30. A compound has the empirical formula $CoCl_3.5NH_3$. When an aqueous solution of this compound is mixed with excess silver nitrate, 2 mol of AgCl precipitate per mol of compound. On reaction with excess HCl, no NH_4^+ is detected. Hence it is
(1) $Co(NH_3)_5Cl_2]Cl$
(2) $[Co(NH_3)_5Cl]Cl_2$
(3) $[Co(NH_3)_5Cl_3]$
(4) $[Co(NH_3)_4Cl_2]Cl.NH_3$

31. Which is incorrect regarding Werner theory :-
(1) Co-ordination compounds metals show two types of valancy.
(2) Primary valency is satisfied by negative ions.
(3) Secondary valency is satisfied by only neutral molecules.
(4) Secondary valency is responsible for geometry of complex.

32. Number of electrolytes in the complex $CoCl_3.5NH_3$
(1) 3 (2) 2 (3) 4 (4) 5

VALENCE BOND THEORY

33. Which of the following compound is paramagnetic
(1) Tetracyanonickelate (II) ion
(2) Tetraamminezinc (II) ion
(3) Hexaamine chromium (III) ion
(4) Diammine silver (I) ion

34. The shape of the complex $[Ag(NH_3)_2]^+$ is :
(1) Octahedral (2) Square planar
(3) Tetrahedral (4) Linear

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35. Hexafluoroferrate(III) ion is an outer orbital complex. The number of unpaired electrons are
(1) 1 (2) 5 (3) 4 (4) 3

36. The shape of $[Cu(NH_3)_4]SO_4$ is :
(1) Square planar (2) Pyramidal
(3) Octahedral (4) Tetrahedral

37. Among the following ions, which one has the highest paramagnetism ?
(1) $[FeF_6]^{3-}$ (2) $[Fe(H_2O)_6]^{2+}$
(3) $[Cu(H_2O)_6]^{2+}$ (4) $[Zn(H_2O)_6]^{2+}$

38. In the complex ion ML_6^{n+}, M^{n+} has five d-electrons and L is weak ligand then the magnetic properties of the complex ion correspond to how many unpaired electrons
(1) 0 (2) 5 (3) 2 (4) 3

39. A magnetic moment of 1.73 BM will be shown by one among of the following compounds .
(1) $[Cu(NH_3)_4]^{2+}$ (2) $[Ni(CN)_4]^{2-}$
(3) $TiCl_4$ (4) $[CoCl_6]^{3-}$

40. The magnetic property and the shape of $[Cr(NH_3)_6]^{3+}$ complex ions are :
(1) Paramagnetic, Octahedral
(2) Diamagnetic, square planar
(3) Paramagnetic, tetrahedral
(4) None of the above

41. Amongest the following ions which one is high spin complex.
(1) $[Cr(NH_3)_6]^{2+}$ (2) $[Fe(H_2O)_6]^{3+}$
(3) $[Cu(H_2O)_6]^{2+}$ (4) $[Zn(H_2O)_6]^{2+}$

42. Which of the following complexes is an inner orbital complex ?
(1) $[CoF_6]^{3-}$ (2) $[FeF_6]^{3-}$
(3) $[Cr(NH_3)_6]^{3+}$ (4) $[Fe(H_2O)_6]^{2+}$

43. What is Incorrect for $K_4[Fe(CN)_6]$
(1) O.N of Iron is +2
(2) It exhibit diamagnetic character
(3) It exhibit paramagnetic character
(4) It involves d^2sp^3 hybridisation

44. In which of the following molecules, central atom used orbitals of different principle quantum number in the hybridisation :-
(1) $[Fe(CO)_5]$ (2) $[Zn(NH_3)_6]^{+2}$
(3) $[Ni(CO)_4]$ (4) $[Ni(NH_3)_6]^{+2}$

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45. What are the geometric shape and the oxidation number of the copper atom, respectively, for the complex ion, $[Cu(NH_3)_4(OH_2)_2]^{2+}$?
(1) Tetrahedral; + 2 (2) Square planar; –2
(3) Linear; + 3 (4) Octahedral; + 2

46. For $[FeF_6]^{3-}$ and $[Fe(CN)_6]^{3-}$ magnetic moment of the fluoride complex is expected to be :-
(1) The same as the magnetic moment of the cyanide complex
(2) Larger than the magnetic moment of the cyanide complex because there are more unpaired electrons in the fluoride complex
(3) Smaller than the magnetic moment of the cyanide complex because there are more unpaired electrons in the fluoride complex
(4) Larger than the magnetic moment of the cyanide complex because there are fewer unpaired electrons in the fluoride complex

47. Which of the following contains one unpaired electron in the 4p orbitals :-
(1) $[Cu(NH_3)_2]^+$ (2) $[Cu(NH_3)_4]^{2+}$
(3) $[Cu(CN)_4]^{3-}$ (4) $[Ni(CN)_4]^{2-}$

48. How many unpaired electrons are present in the Brown Ring complex $[Fe(H_2O)_5(NO)]SO_4$
(1) 4 (2) 3 (3) 0 (4) 5

49. Which of the following statements about $[Cr(CO)_6]$ is correct ?
(1) It is paramagnetic and inner orbital complex
(2) It is diamagnetic and inner orbital complex
(3) It is diamagnetic and outer orbital complex
(4) It is paramagnetic and outer orbital complex

50. Which is true for complex $[Ni(en)_2]^{2+}$?
(1) paramagnetism, dsp^2, square planar, C.N. of Ni =2
(2) diamagnetism, dsp^2, square planar, C.N. of Ni = 4
(3) diamagnetism, sp^3, tetrahedral, C.N. of Ni = 4
(4) paramagnetism, sp^3, tetrahedral, C.N. of Ni = 4

51. Arrange the following in order of decreasing number of unpaired electrons :
I : $[Fe(H_2O)_6]^{2+}$ II : $[Fe(CN)_6]^{3-}$
III : $[Fe(CN)_6]^{4-}$ IV : $[Fe(H_2O)_6]^{3+}$
(1) IV, I, II, III (2) I, II, III, IV
(3) III, II, I, IV (4) II, III, I, IV

52. Spin magnetic moment of $[MnBr_4]^{-2}$ is 5.9 BM its geometry would be :-
(1) Square planer (2) Tetrahedral
(3) Square pyramidal (4) Octahedral

53. The hybridisation in $[Co(C_2O_4)_3]^{-3}$
(1) sp^3d^2 (2) sp^3d^3
(3) dsp^3 (4) d^2sp^3

54. Which complex is diamagnetic ?
(1) $[MnO_4]^-$ (2) $[Co(NH_3)_6]^{+2}$
(3) $[Fe(CN)_6]^{-3}$ (4) $[Cr(H_2O)_6]^{+3}$

CFT, COLOUR OF THE COMPLEX AND STABILITY

55. Which one of these ions absorbs energy from visible spectrum :-
(1) $[Cu(NH_3)_4]^+$ (2) $[Cu(NH_3)_4]^{+2}$
(3) $[Zn(H_2O)_6]^{+2}$ (4) $[CdCl_4]^{-2}$

56. In the complex $[Ni(H_2O)_2(NH_3)_4]^{+2}$ the magnetic moment (μ) of Ni is :-
(1) Zero (2) 2.83 BM
(3) 1.73 BM (4) 3.87 BM

57. Which of the following system has maximum number of unpaired electrons :-
(1) d^5 (Octahedral, low spin)
(2) d^8 (Tetrahedral)
(3) d^6 (Octahedral, low spin)
(4) d^3 (Octahedral)

58. In an octahedral crystal field, the t_{2g} orbitals are
(1) Raised in energy by 0.4 Δ_0
(2) Lowered in energy by 0.4 Δ_0
(3) Raised in energy by 0.6 Δ_0
(4) Lowered in energy by 0.6 Δ_0

59. If $\Delta_0 < P$, the correct electronic configuration for d^4 system will be :-
(1) $t_{2g}^4\ e_g^0$ (2) $t_{2g}^3\ e_g^1$
(3) $t_{2g}^0\ e_g^4$ (4) $t_{2g}^2\ e_g^2$

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60. Match List–I (Complex ions) with List–II (Number of Unpaired Electrons) and select the correct answer using the codes given below the lists :-

List –I (Complex ions)	**List II (Number of Unpaired Electrons)**
A. $[CrF_6]^{4-}$	i. One
B. $[MnF_6]^{4-}$	ii. Two
C. $[Cr(CN)_6]^{4-}$	iii. Three
D. $[Mn(CN)_6]^{4-}$	iv. Four
	v. Five

Code :	**A**	**B**	**C**	**D**
(1)	iv	i	ii	v
(2)	ii	v	iii	i
(3)	iv	v	ii	i
(4)	ii	i	iii	v

61. Consider the following complex formation reactions and comment on their formation constant value

(i) $Fe^{2+}(aq)+6NH_3 \overset{K_f}{\rightleftharpoons} \left[Fe(NH_3)_6\right]^{2+}$

(ii) $Fe^{2+}(aq)+3en \overset{K'_f}{\rightleftharpoons} \left[Fe(en)_3\right]^{2+}$

(1) $K_f > K'_f$

(2) $K_f < K_f'$

(3) $K_f = K_f'$

(4) can not be compared

62. Select most stable complex :-

(1) $[Co(H_2O)_6]^{3+}$ (2) $[Co(NH_3)_2(en)_2]^{+3}$

(3) $[Co(en)_3]^{+3}$ (4) $[Co(NH_3)_4(en)]^{+3}$

63. Red color of gem stone ruby is due to impurities of:-

(1) Al_2O_3 (2) Cr^{+3}

(3) Al^{+3} ions (4) All of these

ISOMERISM

64. A square planar complex is cis platin $[Pt(NH_3)_2Cl_2]$ shows :

(1) Geometrical isomerism

(2) Optical isomerism

(3) Linkage isomerism

(4) Ionisation isomerism

65. The two compounds pentaamminesulphato cobalt (III) bromide and pentaamminebromo cobalt (III) sulphate represent :

(1) Linkage isomerism

(2) Ionisation isomerism

(3) Co-ordination isomerism

(4) Hydrate isomerism

66. Which of the following complex can not exhibit geometrical isomerism :-

(1) $[Pt(NH_3)_2Cl\ NO_2]$

(2) $[Pt(gly)_2]$

(3) $[Cu(en)_2]^{+2}$

(4) $[Pt(H_2O)(NH_3)BrCl]$

67. Which one of the following compounds will exhibit linkage isomerism :-

(1) $[Pt\ (NH_3)_2\ Cl_2]$

(2) $[Co\ (NH_3)_3\ NO_2]Cl_2$

(3) $[Co\ (NH_3)_4\ Cl_2]Cl$

(4) $[Co\ (en)_2Cl_2]Cl$

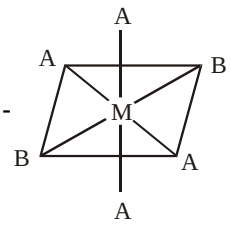
68. The compound $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_4Cl_2]Cl.2H_2O$ respresent

(1) Linkage isomerism

(2) Hydrate isomerism

(3) Ligand isomerism

(4) Ionisation isomerism

69. Compound - 

can be marked as -

(1) Cis form (2) Leavo form

(3) Dextro form (4) Trans form

70. A Planar Complex [Mabcd] gives :-

(1) Two Optical isomer

(2) Two geometrical isomer

(3) Three optical isomer

(4) Three geometrical isomers

71. No. of geometrical isomers expected for octahedral complex [Mabcdef] is :-

(1) Zero (2) 30 (3) 15 (4) 9

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72. Which of the following complex produce ppt with $AgNO_3$ and exist in two geometrical isomeric form
(1) $PtCl_2.4NH_3$ (2) $PtCl_2.3NH_3$
(3) $PtCl_4.4NH_3$ (4) $PtCl_4.2NH_3$

73. $Cis[Pt(en)_2Br_2]Cl_2.2H_2O$ and $trans[Pt(en)_2Br_2]Cl_2.2H_2O$ are :-
(1) Ionisation isomer
(2) Geometrical isomer
(3) Hydrate isomer
(4) Optical isomers

74. Which of the following octahedral complex have maximum stereoisomers :-
(1) $[Fe(CN)_6]^{-4}$ (2) $[Co(en)(CN)_4]^{-1}$
(3) $[Co(en)_2(Cl)_2]^{+}$ (4) $[Co(en)_3]^{+3}$

75. Which of the following complex does not show geometrical isomerism ?
(1) $[Co\ (NH_3)_4\ Cl_2\ ]^{+}$
(2) $[Co\ (NH_3)_3\ (NO_2)_3]$
(3) $[Cr\ (en)_3\ ]^{3+}$
(4) $[Pt\ (gly)_2]$

76. Which of the following complex compounds does not exhibits geometrical isomerism ?
(1) $[PtCl_2(NH_3)_2]$
(2) $[PdCl_2BrI]$
(3) $[Pt(NH_3)\ (py)\ (Cl)\ (Br)]$
(4) $[Pt(NH_3)_3(Br)]$

77. The pair of molecules that exhibit geometrical isomerism are
(1) $[\ Cr(NH_3)_4Cl_2]^{+}$and $[Co(NH_3)_3Cl_3]$
(2) $[Cr\ (NH_3)_5Cl]^{2+}$ and $[Co(NH_3)_5Cl]^{2+}$
(3) $[Cr(NH_3)_6]^{3+}$ and $[Co(NH_3)_6]^{3+}$
(4) All of the above show geometric isomerism

78. Complex $[Co(NH_3)_3\ (NO_2)_3]$ show which isomerism:-
(1) Ionisation and linkage
(2) Linkage and geometrical
(3) Geometrical and ligand
(4) Coordination and linkage

79. Which of the following represents incorrect match?
(1) $[Co(NH_3)_5(NO_2)](NO_3)_2$: Linkage isomerism
(2) $[Pt\ (NH_3)(H_2O)Cl_2]$: Geometrical isomerism
(3) $K[Cr(H_2O)_2(C_2O_4)_2]$: Geometrical and optical
(4) $[Cr(H_2O)_5Cl]Cl_2H_2O$: Hydrate and linkage isomerism

80. $CrCl_3.6H_2O$ show 3 different coloured compounds due to :-
(1) Ionisation isomerism
(2) Coordination isomerism
(3) Optical isomerism
(4) Hydrate isomerism

ORGANOMETALLIC COMPOUNDS

81. Which of the following is π –acid ligand
(1) NH_3 (2) CO
(3) glycinato (4) ethylene diamine

82. Which of the following statement is/are wrong:-
(a) Al_4C_3 is an organometallic compound
(b) Metal carbonyls are organometallic compounds
(c) TEL is π bonded organometallic compound
(d) Frankland reagent is σ - bonded organometallic compound
The answer is:-
(1) c & d (2) a & c (3) a & b (4) b & d

83. Compounds which contain direct metal carbon bonds are called :
(1) Organic compound
(2) Complex compound
(3) Metal carbides
(4) OMC compounds.

84. Which one of the following is a π bonded OMC?
(1) Wilkinson's catalyst
(2) Tetraethyl lead
(3) Zeise's salt
(4) Grignard's reagent

85. Which of the following statement is true
(1) $FeCO_3$ and Fe_3C are organometallic compounds.
(2) In ferrocene ligand is cyclopentadienyl.
(3) Pb $(C_2H_5)_4$ is π-bonded OMC
(4) In zeise salt central metal is sp^3 hybridised.

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86. Which of the following is not an organo metallic compound :-
(1) $(C_2H_5)_2Zn$ (2) $CH_3B(OCH_3)_2$
(3) $B(OCH_3)_3$ (4) $Ni(CO)_4$

87. Number of metal -metal bonds in $[Co_2(CO)_8]$ will be :-
(1) 0 (2) 3 (3) 2 (4) 1

APPLICATION OF COORDINATION CHEMISTRY

88. In a ferric salt on adding $K_4[Fe(CN)_6]$ a prussian blue is obtained which is :-
(1) $K_3[Fe(CN)_6]$ (2) $Fe_3[Fe(CN)_6]_4$
(3) $FeSO_4[Fe(CN)_6]$ (4) $Fe_4[Fe(CN)_6]_3$

89. Hypo is used in photography because it is :-
(1) A reducing agent
(2) An oxidising agent
(3) A Complexing agent
(4) Photo sensitive Compound

90. The solubility of AgBr in hypo solution is due to the formation of :-
(1) Ag_2SO_3 (2) $Ag_2S_2O_3$
(3) $[Ag(S_2O_3)]^-$ (4) $[Ag(S_2O_3)_2]^{3-}$

91. Which of the following is related to Nessler's reagent?
(1) $PtCl_4 + KCl \rightarrow$ (2) $AgCl + NH_3 \rightarrow$
(3) $AgBr + Na_2S_2O_3 \rightarrow$ (4) $HgI_2 + KI \rightarrow$

92. $K_4[Fe(CN)_6]$ reacts with $FeCl_3$ to form :-
(1) $K_3[Fe(CN)_6]$ (2) $K_4[Fe(CN)_3Cl_3]$
(3) $K_3[Fe(CN)_5Cl]$ (4) $KFe[Fe(CN)_6]$

93. A reagent used for identifying nickel ion is :-
(1) Potassium ferrocyanide
(2) Phenolphthalein
(3) Dimethyl glyoxime
(4) EDTA

94. Which one of the following statement is false for nickel-dimethylglyoximate complex ?
(1) The stability of complex is only due to the presence of intra-molecular hydrogen bonding
(2) The complex is stable, only because dimethyl glyoxime ligand is a stronger ligand
(3) The complex is stable as it has five membered chelate rings as well as intra molecular hydrogen bonding
(4) (1) and (2) both

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	1	4	4	2	4	3	4	1	2	2	2	4	2	4	2
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	3	2	1	1	1	1	3	2	2	2	3	4	2	2
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	3	1	3	4	2	1	1	2	1	1	2	3	3	1	4
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	2	2	2	2	2	1	2	4	1	2	2	4	2	2	3
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	2	3	2	1	2	3	2	2	4	4	3	3	2	3	3
Question	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Answer	4	1	2	4	4	2	2	4	3	2	3	4	4	3	4
Question	91	92	93	94											
Answer	4	4	3	4											

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Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. Copper sulphate dissolves in excess of KCN to give
(1) $Cu(CN)_2$ (2) CuCN
(3) $[Cu(CN)_4]^{3-}$ (4) $[Cu(CN)_4]^{2-}$

2. $[Co(NH_3)_4(NO_2)_2]Cl$ exhibits
(1) linkage isomerism, geometrical isomerism and optical isomerism
(2) linkage isomerism, ionization isomerism and optical isomerism
(3) linkage isomerism, ionization isomerism and geometrical isomerism
(4) ionization isomerism, geometrical isomerism and optical isomerism

AIPMT 2007

3. Which of the following will give a pair of enantiomers
(1) $[Cr(NH_3)_6][Co(CN)_6]$
(2) $[Co(en)_2Cl_2]Cl$
(3) $[Pt(NH_3)_4][PtCl_6]$
(4) $[Co(NH_3)_4Cl_2]NO_2$

4. The d electron configurations of Cr^{2+}, Mn^{2+}, Fe^{2+} and Ni^{2+} are $3d^4$, $3d^5$, $3d^6$ and $3d^8$ respectively. Which one of the following aqua complexes will exhibit the minimum paramagnetic behaviour
(1) $[Fe(H_2O)_6]^{2+}$ (2) $[Ni(H_2O)_6]^{2+}$
(3) $[Cr(H_2O)_6]^{2+}$ (4) $[Mn(H_2O)_6]^{2+}$

AIPMT 2008

5. Which of the following complexes exhibits the highest paramagnetic behaviour ?
Where gly = glycine, en = ethylenediamine and bpy = bipyridyl (At. No. Ti = 22, V = 23, Fe = 26, Co = 27)
(1) $[Co(OX)_2(H_2O)_2]^-$
(2) $[Ti(NH_3)_6]^{3+}$
(3) $[V(gly)_2(OH)_2(NH_3)_2]^+$
(4) $[Fe(en)(bpy)(NH_3)_2]^{2+}$

6. In which of the following coordination entities the magnitude of Δo (CFSE in octahedral field) will be maximum ?
(1) $[Co(CN)_6]^{3-}$ (2) $[Co(C_2O_4)_3]^{3-}$
(3) $[Co(H_2O)_6]^{3+}$ (4) $[Co(NH_3)_6]^{3+}$

AIPMT 2009

7. Which of the following complex ions is expected to absorb visible light?
(1) $[Zn(NH_3)_6]^{2+}$
(2) $[Sc(H_2O)_3(NH_3)_3]^{3+}$
(3) $[Ti(en)_2(NH_3)_2]^{4+}$
(4) $[Cr(NH_3)_6]^{3+}$

8. Out of TiF_6^{2-}, CoF_6^{3-}, Cu_2Cl_2 and $NiCl_4^{2-}$ colourless species are :
(1) CoF_6^{3-} and $NiCl_4^{2-}$ (2) TiF_6^{2-} and CoF_6^{2-}
(3) Cu_2Cl_2 and $NiCl_4^{2-}$ (4) TiF_6^{2-} and Cu_2Cl_2

9. Which of the following does not show optical isomerism?
(1) $[Co(en)_3]^{3+}$
(2) $[Co(en)_2Cl_2]^+$
(3) $[Co(NH_3)_3Cl_3]^0$
(4) $[Co(en)Cl_2(NH_3)_2]^+$

10. Which one of the following complexes is **not** expected to exhibit isomerism :-
(1) $[Pt(NH_3)_2Cl_2]$
(2) $[NiCl_4]^{2-}$
(3) $[Ni(en)_3]^{2+}$
(4) $[Ni(NH_3)_4(H_2O)_2]^{2+}$

AIPMT 2010

11. Which of the following complex ion is not expected to absorb visible light ?
(1) $[Ni(H_2O)_6]^{2+}$ (2) $[Ni(CN)_4]^{2-}$
(3) $[Cr(NH_3)_6]^{3+}$ (4) $[Fe(H_2O)_6]^{2+}$

12. The existence of two different coloured complexes with the composition of $[Co(NH_3)_4Cl_2]^+$ is due to:-
(1) Ionization isomerism
(2) Linkage isomerism
(3) Geometrical isomerism
(4) Coordination isomerism

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13. Crystal field stabilization energy for high spin d^4 octahedral complex is :-
(1) $-0.6\ \Delta_0$ (2) $-1.8\ \Delta_0$
(3) $-1.6\ \Delta_0 + P$ (4) $-1.2\ \Delta_0$

AIPMT Pre. 2011

14. Of the following complex ions, which is diamagnetic in nature ?
(1) $[NiCl_4]^{2-}$ (2) $[Ni(CN)_4]^{2-}$
(3) $[CuCl_4]^{2-}$ (4) $[CoF_6]^{3-}$

15. The complex $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ are the examples of which type of isomerism ?
(1) Linkage isomerism
(2) Ionization isomerism
(3) Coordination isomersim
(4) Geometrical isomerism

16. The complex $[Pt(Py)(NH_3)BrCl]$ will have how many geometrical isomers ?
(1) 3 (2) 4 (3) 0 (4) 2

AIPMT Mains 2011

17. Which of the following carbonyls will have the strongest C–O bond ?
(1) $[Fe(CO)_5]$ (2) $[Mn(CO)_6]^+$
(3) $[Cr(CO)_6]$ (4) $[V(CO)_6]^-$

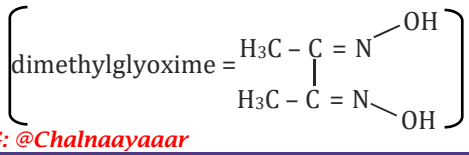
18. Which of the following complex compounds will exhibit highest paramagnetic behaviour :-
(At. No. Ti = 22, Cr = 24, Co = 27, Zn = 30)
(1) $[Zn(NH_3)_6]^{2+}$ (2) $[Ti(NH_3)_6]^{3+}$
(3) $[Cr(NH_3)_6]^{3+}$ (4) $[Co(NH_3)_6]^{3+}$

AIPMT Pre. 2012

19. Which one of the following is an outer orbital complex and exhibits paramagnetic behaviour?
(1) $[Cr(NH_3)_6]^{3+}$ (2) $[Co(NH_3)_6]^{3+}$
(3) $[Ni(NH_3)_6]^{2+}$ (4) $[Zn(NH_3)_6]^{2+}$

AIPMT Mains 2012

20. Red precipitate is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal Ni(II). Which of the following statements is not true ?

dimethylglyoxime = 

(1) Red complex has a tetrahedral geometry.
(2) Dimethylglyoxime functions as bidentate ligand.
(3) Red complex has a square planar geometry.
(4) Complex has symmetrical H-bonding.

21. Low spin complex of d^6–cation in an octahedral field will have the following energy:-
(Δ_0 = Crystal field splitting energy in an octahedral field, P = Electron pairing energy)
(1) $\frac{-2}{5}\Delta_0 + 2P$ (2) $\frac{-2}{5}\Delta_0 + P$
(3) $\frac{-12}{5}\Delta_0 + P$ (4) $\frac{-12}{5}\Delta_0 + 3P$

NEET-UG 2013

22. A magnetic moment of 1.73 BM will be shown by one among the following :-
(1) $[CoCl_6]^{4-}$ (2) $[Cu(NH_3)_4]^{2+}$
(3) $[Ni(CN)_4]^{2-}$ (4) $TiCl_4$

AIPMT 2014

23. Which of the following complexes is used to be as an anticancer agent?
(1) mer-$[Co(NH_3)_3Cl_3]$ (2) cis-$[PtCl_2(NH_3)_2]$
(3) cis-$K_2[PtCl_2Br_2]$ (4) Na_2CoCl_4

AIPMT 2015

24. Cobalt (III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test of chloride ions with silver nitrate at 25°C?
(1) $CoCl_3 \cdot 4NH_3$ (2) $CoCl_3 \cdot 5NH_3$
(3) $CoCl_3 \cdot 6NH_3$ (4) $CoCl_3 \cdot 3NH_3$

25. Which of these statements about $[Co(CN)_6]^{3-}$ is true:-
(1) $[Co(CN)_6]^{3-}$ has four unpaired electrons and will be in a low-spin configuration.
(2) $[Co(CN)_6]^{3-}$ has four unpaired electrons and will be in a high spin configuration.
(3) $[Co(CN)_6]^{3-}$ has no unpaired electrons and will be in a high-spin configuration.
(4) $[Co(CN)_6]^{3-}$ has no unpaired electrons and will be in a low-spin configuration.

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Re-AIPMT 2015

26. The name of complex ion, $[Fe(CN)_6]^{3-}$ is :-
(1) Tricyanoferrate (III) ion
(2) Hexacyanidoferrate (III) ion
(3) Hexacyanoiron (III) ion
(4) Hexacyanitoferrate (III) ion

27. The hybridization involved in complex $[Ni(CN)_4]^{2-}$ is (At.No. Ni = 28)
(1) d^2sp^2 (2) d^2sp^3 (3) dsp^2 (4) sp^3

28. The sum of coordination number and oxidation number of the metal M in the complex $[M(en)_2(C_2O_4)]Cl$ (where en is ethylenediamine) is:-
(1) 7 (2) 8 (3) 9 (4) 6

29. Number of possible isomers for the complex $[Co(en)_2Cl_2]$ Cl will be : (en = ethylenediamine)
(1) 3 (2) 4 (3) 2 (4) 1

NEET-I 2016

30. Which of the following has longest C–O bond length? (Free C–O bond length in CO is 1.128Å).
(1) $Ni(CO)_4$ (2) $[Co(CO)_4]^-$
(3) $[Fe(CO)_4]^{2-}$ (4) $[Mn(CO)_6]^+$

NEET(UG) 2017

31. An example of a sigma bonded organometallic compound is :
(1) Grignard's reagent (2) Ferrocene
(3) Cobaltocene (4) Ruthenocene

32. Pick out the correct statement with respect to $[Mn(CN)_6]^{3-}$:-
(1) It is sp^3d^2 hybridised and tetrahedral
(2) It is d^2sp^3 hybridised and octahedral
(3) It is dsp^2 hybridised and square planar
(4) It is sp^3d^2 hybridised and octahedral

33. Correct increasing order for the wavelengths of absorption in the visible region the complexes of Co^{3+} is :-
(1) $[Co(H_2O)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[Co(NH_3)_6]^{3+}$
(2) $[Co(H_2O)_6]^{3+}$, $[Co(NH_3)_6]^{3+}$, $[Co(en)_3]^{3+}$
(3) $[Co(NH_3)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[Co(H_2O)_6]^{3+}$
(4) $[Co(en)_3]^{3+}$, $[Co(NH_3)_6]^{3+}$, $[Co(H_2O)_6]^{3+}$

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NEET(UG) 2018

34. The type of isomerism shown by the complex $[CoCl_2(en)_2]$ is
(1) Geometrical isomerism
(2) Coordination isomerism
(3) Ionization isomerism
(4) Linkage isomerism

35. The geometry and magnetic behaviour of the complex $[Ni(CO)_4]$ are
(1) Square planar geometry and diamagnetic
(2) Tetrahedral geometry and diamagnetic
(3) Square planar geometry and paramagnetic
(4) Tetrahedral geometry and paramagnetic

36. Iron carbonyl, $Fe(CO)_5$ is
(1) Tetranuclear (2) Mononuclear
(3) Trinuclear (4) Dinuclear

NEET(UG) 2019

37. What is the **correct** electronic configuration of the central atom in $K_4[Fe(CN)_6]$ based on crystal field theory ?
(1) $t_{2g}^4e_g^2$ (2) $t_{2g}^6e_g^0$ (3) $e^3t_2^3$ (4) $e^4t_2^2$

NEET(UG) 2019 (ODISHA)

38. The Crystal Field Stabilisation Energy (CFSE) for $[CoCl_6]^{4-}$ is 18000 cm^{-1}. The CFSE for $[CoCl_4]^{2-}$ will be-
(1) 6000 cm^{-1} (2) 16000 cm^{-1}
(3) 18000 cm^{-1} (4) 8000 cm^{-1}

NEET(UG) 2020

39. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds ?
(1) $CN^- < C_2O_4^{2-} < SCN^- < F^-$
(2) $SCN^- < F^- < C_2O_4^{2-} < CN^-$
(3) $SCN^- < F^- < CN^- < C_2O_4^{2-}$
(4) $F^- < SCN^- < C_2O_4^{2-} < CN^-$

40. Urea reacts with water to form A which will decompose to form B. B when passed through Cu^{2+} (aq), deep blue colour solution C is formed. What is the formula of C from the following ?
(1) $CuCO_3 \cdot Cu(OH)_2$ (2) $CuSO_4$
(3) $[Cu(NH_3)_4]^{2+}$ (4) $Cu(OH)_2$

NEET(UG) 2021

41. Ethylene diaminetetraacetate (EDTA) ion is:

(1) Hexadentate ligand with four "O" and two "N" donor atoms

(2) Unidentate ligand

(3) Bidentate ligand with two "N" donor atoms

(4) Tridentate ligand with three "N" donor atoms

42. Match List-I with List-II

List-I		List-II	
(a)	$[Fe(CN)_6]^{3-}$	(i)	5.92 BM
(b)	$[Fe(H_2O)_6]^{3+}$	(ii)	0 BM
(c)	$[Fe(CN)_6]^{4-}$	(iii)	4.90 BM
(d)	$[Fe(H_2O)_6]^{2+}$	(iv)	1.73 BM

Choose the **correct** answer from the options given below

(1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

(2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

(3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

(4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	**3**	**3**	**2**	**2**	**2**	**1**	**4**	**4**	**3**	**2**	**2**	**3**	**1**	**2**	**3**
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	**1**	**2**	**3**	**3**	**1**	**4**	**2**	**2**	**4**	**4**	**2**	**3**	**3**	**1**	**3**
Question	31	32	33	34	35	36	37	38	39	40	41	42			
Answer	1	2	4	1	2	2	2	4	2	3	1	4			

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Exercise – III (Analytical Questions) Master Your Understanding

1. Given below are two statements :
Statement-I : Complex $[Fe(H_2O)_5(NO)]SO_4$ is paramagnetic.
Statement-II : The Fe in Complex $[Fe(H_2O)_5(NO)]SO_4$ has three unpaired electrons.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

2. Given below are two statements :
Statement-I : All the geometrical formers of the complex $[M(NH_3)_4Cl_2]$ are optically inactive.
Statement-II : Both geometrical isomers of the complex $[M(NH_3)_4Cl_2]$ does not posses plane of symmetry.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

3. Given below are two statements :
Statement-I : $[Cr(H_2O)_6]Cl_2$ and $[Fe(H_2O)_6]Cl_2$ are oxidising in nature.
Statement-II : $[Fe(CN)_6]^{4-}$ ion is an outer orbital complex.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

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4. Given below are two statements :
Statement-I : Cis-platin is used in the treatment of Cancer.
Statement-II : EDTA is used for treatment of lead poisoning.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

5. Given below are two statements :
Statement-I : The metal to ligand bonding creates a synergic effect which strength the bond between CO and the metal.
Statement-II : The complex with d^0 and d^{10} configuration show d–d transition.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

6. Given below are two statements :
Statement-I : The primary valency are normally ionisable and are satisfied by negative ions.
Statement-II : The secondary valency are non-ionisable are satisfied by neutral molecules or negative ions.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

7. Given below are two statements :
Statement-I : Valence bond theory explain the colour exhibited by co-ordination compounds.
Statement-II : CFT considers the metal-ligand bond to be ionic from electrostatic interactions between the metal ion and the ligand.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

8. Given below are two statements :
Statement-I : d^4 to d^7 co-ordination entities are less stable for strong field as compound to weak field cases.
Statement-II : Ruby is aluminium oxide (Al_2O_3) containing about 0.5 – 1% Cr^{+2} ions (d^4).
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

9. Given below are two statements :
Statement-I : Decacarbonyl diamangnes (0) is made up of two square bipyramidal $[Mn(CO)_5]$ units joined by a Mn–Mn bond.
Statement-II : Zero oxidation state of central metal cannot be stabilised by CO groups.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

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10. Given below are two statements :
Statement-I : Excess of copper and iron from plant/animal systems are removed by the chelating ligands D-penicillamine and deferrioxime B via the formation of Co-ordination compounds.
Statement-II : Crystal field splitting energy in tetrahedral complex is less as compared to the octahedral complexes.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Statement-I and Statement-II are correct.
(2) Statement-I is correct but Statement-II is incorrect.
(3) Both Statement-I and II are incorrect.
(4) Statement-I is incorrect but Statement-II is correct.

11. Given below are two statements :
Assertion : EDTA ligand forms complex with metal ion of 3d series in the ratio of 1 : 1
Reason : EDTA ligand has four –COOH group's
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(3) (A) is correct but (R) is not correct.
(4) (A) is not correct but (R) is correct.

12. **Assertion :** The correct order of the wavelength of absorption in the visible vision is
$[Ni(NO_2)_6]^{4-} < [Ni(NH_3)_6]^{+2} < [Ni(H_2O)_6]^{+2}$
Reason : The stability of different complexes depends on the strength of the ligand field of the various ligand
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(3) (A) is correct but (R) is not correct.
(4) (A) is not correct but (R) is correct.

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13. **Assertion :** $KMnO_4$ & $K_2Cr_2O_7$ both are coloured compound.
Reason : The colour of the compound is only due to d–d transition.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(3) (A) is correct but (R) is not correct.
(4) (A) is not correct but (R) is correct.

14. **Assertion :** Cu^{+2} ion never form complex with CN^- & I^- ions.
Reason : Cu^{+2} is a stronger oxidising while CN^- & I^- both are stronger reducing agent.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(3) (A) is correct but (R) is not correct.
(4) (A) is not correct but (R) is correct.

15. **Assertion :** The colour of $[Co(NH_3)_5NO_2]^{+2}$ and $[Co(NH_3)_5ONO]^{2+}$ is different.
Reason : Both are linkage isomers.
In the light of the above statements, choose the **most appropriate** answer from the options given below :
(1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
(3) (A) is correct but (R) is not correct.
(4) (A) is not correct but (R) is correct.

16. Match the column :

Column-I [Complex Ion]		**Column-II [Hybridisation & no. of unpaired electron]**	
(1)	$[Co(H_2O)_6]^{+3}$	(a)	dsp^2, 0
(2)	$[Fe(CN)_6]^{3-}$	(b)	dsp^2, 1
(3)	$[Ni(CN)_4]^{2-}$	(c)	d^2sp^3, 0
(4)	$[Co(CN)_4]^{2-}$	(d)	d^2sp^3, 1

(1) 1 - c, 2 - a, 3 - d, 4 - b
(2) 1 - c, 2 - d, 3 - b, 4 - a
(3) 1 - c, 2 - d, 3 - a, 4 - b
(4) 1 - a, 2 - c, 3 - d, 4 - b

17. Match the column :

Column-I [Complex Ion]		**Column-II [No. of geometrical Isomer]**	
(1)	$[Co(NH_3)_6]^{+3}$	(a)	5
(2)	$[Co(NH_3)_2Cl_2Br_2]^-$	(b)	0
(3)	$[Pt(NH_3)_3Cl_3]^+$	(c)	15
(4)	$[Pt(NH_3)(H_2O)(Py)ClBr\ I]^+$	(d)	2

(1) 1 - b, 2 - d, 3 - a, 4 - c
(2) 1 - b, 2 - a, 3 - d, 4 - c
(3) 1 - a, 2 - b, 3 - d, 4 - c
(4) 1 - c, 2 - a, 3 - d, 4 - b

18. Match the column :

Column-I (Complexion)		**Column-II (Type of complex with magnetic moment)**	
(1)	$[Co(OX)_3]^{3-}$	(a)	Inner orbital, complex, $\mu = \sqrt{3}$
(2)	$[Fe(EDTA)]^-$	(b)	Outer orbital, complex, $\mu = \sqrt{24}$
(3)	$[MnF_6]^{3-}$	(c)	Outer orbital, complex, $\mu = \sqrt{8}$
(4)	$[Ni(H_2O)_6]^{+2}$	(d)	Inner orbital, complex, $\mu = 0$

(1) 1 - d, 2 - a, 3 - b, 4 - c
(2) 1 - c, 2 - a, 3 - b, 4 - d
(3) 1 - d, 2 - b, 3 - a, 4 - c
(4) 1 - a, 2 - d, 3 - b, 4 – c

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19. Match the column :

Column-I [Confiscation in octahedral complex]		Column-II [Magnetic moment]	
(1)	d^4 [Low spin]	(a)	$\mu = \sqrt{3}$ BM
(2)	d^4 [High spin]	(b)	$\mu = \sqrt{35}$ BM
(3)	d^5 [Low spin]	(c)	$\mu = \sqrt{8}$ BM
(4)	d^5 [High spin]	(d)	$\mu = \sqrt{24}$ BM

(1) 1 - b, 2 - d, 3 - a, 4 - c
(2) 1 - a, 2 - d, 3 - d, 4 - b
(3) 1 - d, 2 - c, 3 - a, 4 - b
(4) 1 - c, 2 - d, 3 - a, 4 - b

20. Match the column :

Column-I [Complex Ion]		Column-II [Total no. of chelate ring]	
(1)	$[Fe(EDTA)]^-$	(a)	2
(2)	$[Ni(dmg)_2]$	(b)	3
(3)	$[Fe(en)_3]^{+3}$	(c)	4
(4)	$[Co(en)_2Cl_2]^+$	(d)	5

(1) 1 - a, 2 - c, 3 - b, 4 - d
(2) 1 - d, 2 - c, 3 - b, 4 - a
(3) 1 - b, 2 - c, 3 - d, 4 - a
(4) 1 - c, 2 - d, 3 - b, 4 - a

21. Match the column :

Column-I [Complex Ion]		Column-II [Value of CFSE]	
(1)	$[Cr(H_2O)_6]^{+2}$	(a)	Zero
(2)	$[Cr(NH_3)_6]^{+2}$	(b)	$-0.4\ \Delta_0$
(3)	$[Fe(H_2O)_6]^{+3}$	(c)	$-0.6\ \Delta_0$
(4)	$[CoF_6]^{3-}$	(d)	$-1.6\ \Delta_0 + P$

(1) 1 - a, 2 - c, 3 - b, 4 - d
(2) 1 - b, 2 - d, 3 - c, 4 - a
(3) 1 - c, 2 - d, 3 - a, 4 - b
(4) 1 - d, 2 - a, 3 - c, 4 – b

22. Match the column :

Column-I (Complex compound)		Column-II (Element)	
(1)	Chlorophyll	(a)	Rhodium
(2)	Blood pigment	(b)	Cobalt
(3)	Vitamin B_{12}	(c)	Magnesium
(4)	Wilkinson catalyst	(d)	Iron

(1) 1 - a, 2 - d, 3 - b, 4 - c
(2) 1 - c, 2 - d, 3 - b, 4 - a
(3) 1 - c, 2 - b, 3 - d, 4 - a
(4) 1 - d, 2 - a, 3 - b, 4 – c

23. Which of the following is/are inner orbital complex(es) ?

(A) $[Fe(NH_3)_6]^{+2}$ (B) $[Co(H_2O)_6]^{+3}$
(C) $[Mn(NH_3)_6]^{+2}$ (D) $[Co(C_2O_4)_3]^{-3}$

(1) If (A), (B) and (C) options are correct.
(2) If (A) and (B) both options are correct.
(3) If (B) and (D) both options are correct.
(4) If (A) and (C) both options are correct.

24. The compound(s) belonging to the alum family is(are)

(A) $K.Al(SO_4)_2.12H_2O$
(B) $K_2SO_4.Cr_2(SO_4)_3.24H_2O$
(C) $FeSO_4.(NH_4)_2SO_4.6H_2O$
(D) $KCl.MgCl_2.6H_2O$

(1) If (A), (B) and (C) options are correct.
(2) If (A) and (B) both options are correct.
(3) If (B) and (D) both options are correct.
(4) If (A) and (C) both options are correct.

25. Which of the following complexes is/are have square planar in shape

(A) $[Cu(H_2O)_4]^{+2}$ (B) $[Ni(CN)_4]^{-2}$
(C) $[Pt(Gly)_2]$ (D) $[Zn(Cl)_4]^{-2}$

(1) If (A), (B) and (C) options are correct.
(2) If (A) and (B) both options are correct.
(3) If (B) and (D) both options are correct.
(4) If (A) and (C) both options are correct.

26. Which statement is/are correct :-

(A) $[Ni(CO)_4]$ tetrahedral & diamagnetic
(B) $[Ni(CN)_4]^{-2}$ square planer & diamagnetic
(C) $[Cu(NH_3)_4]^{+2}$ tetrahedral and diamagnetic
(D) $[NiCl_4]^{-2}$ tetrahedral and paramagnetic

(1) If (A), (B) and (C) options are correct.
(2) If (A) and (B) and (D) options are correct.
(3) If (B) and (C) both options are correct.
(4) If (A) and (C) both options are correct.

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27. Which of the following complexes are paramagnetic in nature ?

(A) $[Ni(CO)_4]$ (B) $[Mn(CN)_6]^{-3}$

(C) $[Co(H_2O)_6]^{+3}$ (D) $[Ni(NH_3)_6]^{+2}$

(1) If (A), (B) and (C) options are correct.
(2) If (A) and (B) both options are correct.
(3) If (B) and (D) both options are correct.
(4) If (A) and (C) both options are correct.

28. Correct match is/are -

(A) Nesseler's reagent – $K_2[HgI_4]$ + KOH

(B) Ferrocene – $[Fe\{\eta^2-C_5H_5\}_2]$

(C) Chromocene – $[Cr(\eta^6 - C_6H_6)_2]$

(D) Zeilglar Natta catalyst – $[(Ph_3P)_3RhCl]$

(1) If (A), (B) and (C) options are correct.
(2) If (A) and (B) both options are correct.
(3) If (B) and (D) both options are correct.
(4) If (A) and (C) both options are correct.

29. Which is true for $EDTA^{-4}$ ligand :-

(A) Chelating ligand
(B) Flexidentate ligand
(C) Polydentate ligands
(D) Ambidentate ligands

(1) If (A), (B) and (C) options are correct.
(2) If (A) and (B) both options are correct.
(3) If (B) and (D) both options are correct.
(4) If (A) and (C) both options are correct.

30. Which are organometallic compound

(A) Zeise's salt
(B) Ferrocene
(C) Grignard reagent
(D) Cis-platin

(1) If (A), (B) and (C) options are correct.
(2) If (A) and (B) both options are correct.
(3) If (B) and (D) both options are correct.
(4) If (A) and (C) both options are correct.

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	**1**	**2**	**3**	**1**	**2**	**1**	**4**	**3**	**2**	**1**	**3**	**2**	**3**	**1**	**1**
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	**3**	**2**	**1**	**4**	**2**	**3**	**2**	**3**	**2**	**1**	**2**	**3**	**1**	**1**	**1**

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Important Notes